

REMARKS/ARGUMENTS

Reconsideration of this application is respectfully requested.

In response to the rejection of claims 7-9 under 35 U.S.C. §112, second paragraph, these claims have been amended above so as to obviate the stated objections.

Accordingly, all outstanding formal issues are now believed to have been resolved in the applicant's favor.

The rejection of claims 7-8 under 35 U.S.C. §103 as allegedly being made "obvious" based on Yamagata '051 in view of Hinks '190 is respectfully traversed.

The Examiner alleges that Figure 10 in Yamagata teaches an MRI shim coil 91 having a plurality of layers with a plurality of turns with insulating the layer therebetween and including plural sections 92a, 92b,92h with each section of the MRI shim coil incorporating some of the plurality of layers.

Actually, Figure 10 schematically depicts a single cylindrical line drawing having reference numbers 91 and 92a...92h associated therewith. The only text accompanying this schematic Figure drawing is at column 7, lines 36-47 which describes item 91 as a shim coil unit having separately fed independent elements 92a...92h (i.e., each of the independent coil elements being fed by its own independent shim amplifier 93a...93h).

In reality, only one of the shim coil elements 92a...92h would even arguably be comparable to applicant's claimed MRI shim coil. As the Examiner will appreciate, there is

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absolutely no description of how any one of these independent shim coils 92a...92h is wound (i.e., whether it comprises one or more turns, one or more layers, insulation between the layers if any plural layers are present, any possible deviation from the usual turn-to-turn connections within a multi-turn coil, etc.). In short, Yamagata is essentially irrelevant with respect to the applicant's claimed invention because the applicant has never claimed to be the first to provide an MRI shim coil per se. At best, that is all that Yamagata '051 can possibly disclose that would be relevant to the applicant's invention.

Indeed, the Examiner has already recognized that Yamagata fails to disclose the "specific arrangement of the MRI shim coil turns in each layer". For this admitted deficiency, the Examiner relies upon Hinks '190. However, Hinks is directed to a system of independent x, y, z shim coils for use with the main polarizing field B_o . Each of the x, y, z shim coils is itself an independent coil. The Examiner's own description of the showing in Figures 8 and 9 seems to indicate that all of the turns of any given one of these x, y, z shim coils is found in only a single layer (it will be noted that the x and y coils are identical but for a 90 degrees spatial phase shift and thus the "x, y" reference characters associated with Figure 8 do not imply any kind of interconnection whatsoever between the winding of the x coil with the winding of the y coils).

The rejection of claim 9 under 35 U.S.C. §103 as allegedly being made "obvious" based on Yamagata/Hinks in further view of Miyamoto '346 is also respectfully traversed.

As already noted above, the primary and secondary references are critically deficient in relevance to any aspect of the applicant's claimed invention (e.g., except for the fact that the prior art did, of course, teach some kind of MRI shim coils). Miyamoto does not supply those

deficiencies -- nor is it particularly relevant with respect to the addition of an insulating layer of glass fiber between the plural layers of turns in a single MRI shim coil, etc.

In the field of MRI, it is important to avoid confusion between two distinct things, one being a shim coil system and the other being an MRI shim coil. It is common in MRI parlance to refer to a shim coil or gradient coil when what is actually meant is an assembly comprising multiple, electrically isolated, functionally distinct windings or coils. The present invention is concerned with the way in which an individual MRI shim coil is wound.

The prior art which the Examiner has cited deals only generally with shim coil systems and not with the way in which individual coils of such system are wound. This distinction is made in the claims by reference to an electrical coil -- meaning a single coil driven by a single electrical source. The plurality of sections or sub-sections of the claimed electrical coil are quite distinct from the plurality of separate shim coil elements referred to in, for example, Yamagata at column 7, lines 31-47. The shim coil elements referred to in this section of Yamagata are quite clearly electrically and functionally distinct shim elements and there is no disclosure of how an individual shim coil element is wound.

Thus, Yamagata cannot disclose the subject matter of the present invention which is concerned with the winding of an individual coil element. The fact that Yamagata deals with a number of coil elements and not with individual elements can be seen by the statement which says that the intensities of the currents from the shim amplifiers (93) are controlled by a controller (95) so that the optimum homogeneity can be claimed for every object body. Thus it is clear that this is dealing with currents being supplied to different coil elements.

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In the case of Hinks similar comments apply. The item (406) to which the Examiner refers on page 3 of the office action is said by the Examiner to be at least one MRI shim coil, whereas the patent refers to 406 as a set of shim coils (406) (see column 8, line i). Hinks has nothing to say about the way in which each individual shim coil, which makes up the set of coils (406) is wound and therefore, like Yamagata, does not have anything relevant to say, in relation to the claimed subject matter.

The Examiner goes on to say that each shim coil has a plurality of layers (408, 410) with a plurality of turns x, y, z and only some of the turns x, 6, Figure 8 or z of Figure 9 in each layer. However, in MRI there are x, y and z shim coils which are independent coils which make up a shim coil set. These are the x, y and z coils shown in Figure 7, but this is not a disclosure of how each individual coil is wound. The reference characters x, y and z each refer to an entire coil and not to turns of a single coil. See, for example, line 59 in column 8, which clearly refers to x, y and z shim coils, there being for the respective G_x , G_y and G_z gradient fields.

Hinks contains no suggestion whatsoever that individual electrically distinct shim coils even have a plurality of layers. the item (406) should be considered as a shim coil system and not an individual shim coil.

The Examiner's attention is also drawn to method claim 16. Among other things, method claim 16 for reducing a self-resonant frequency of an MRI shim coil requires arranging an MRI shim coil in plural coil sections, each section containing a plurality of layers of windings made of insulated conductor and each layer having a plurality of turns. In addition, each of such coil sections is arranged in two or more sub-sections, each sub-section incorporating turns in at least

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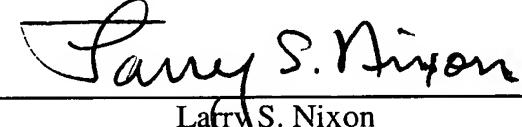
one of the plural layers so as to reduce the self-resonant frequency of the shim coil. Clearly, there is no teaching or suggestion of any such methodology in any of the cited references.

Accordingly, this entire application is now believed to be in allowable condition and a formal Notice to that effect is respectfully solicited.

Respectfully submitted,

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